

Annual Review of Phytopathology, 2013. Neal K. Van Alfen, Jan E. Leach and Steven Lindow. Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 51, ix + 611 pp. Price: US\$ 92.

Plant diseases being a major threat to consistent crop production, a constant update of the current accomplishments in the field of plant pathology is imperative to the research community to make greater strides in food production. In this context, the book under review has compiled the advances in different areas of plant pathological research made over the past years with due projections for the future. We appreciate the efforts for a new compilation of balanced, objective and up-to-date exploration in key areas of phytopathological research. The volume consists of 27 articles beginning with a review on decision-support systems, which is amply complemented by two more articles, one on assessing the extent of implementation and the other on the spatial pattern analysis of plant disease epidemics. A critical appraisal on plant–pathogen interactions in disease development has been enabled with seven articles focusing on their molecular intricacies. Likewise, nine articles look in detail at the different prospects of disease management employing intercropping, host resistance, viral vectors and microbial genomics. Eight articles focus on the specifics of plant diseases describing the biology, evolution and genomics of the disease-causing agents, bacteria, nematodes and viruses. Thus, this volume will be useful for those who are concerned with plant diseases for enhancing agricultural productivity.

Forecasting disease epidemics is predicting the occurrence of diseases well before the occurrence of actual disease symptoms. Forecasting systems are imperative with the changing climate and help growers to take economic decisions to manage diseases. The increasing complexity of the decision-making process has led to a more integrated approach to disease control through decision support systems. The two articles by Shtienberg and Gent *et al.* have analysed the extent and problem of implementation of decision support systems in managing plant diseases as well as their impact in agriculture. The latter article is also a critical appraisal of the impact of persistent defi-

ciencies in the process of evaluating the level of implementation. The article by Turechek and McRoberts has complemented these reviews by highlighting the established and newer concepts on scale and their importance in the spatial pattern analysis of plant disease epidemics. The three articles together, apart from integrating observations on the significance of epidemics, which is vital in developing suitable forecasting systems, also deal in detail with the problems in this field that have come to be the mainstay of disease management in plants.

Understanding the mechanisms by which pathogens cause diseases and plants defend themselves against them enables development of novel alternative management strategies to ensure food security. Pathogenic microbes are able to perceive and respond to changes in the environment, including the presence of a host using signalling cascades that alter target gene expression in response to environmental changes. In this context, the articles on ‘Chemical signaling between plants and plant–pathogenic bacteria’ and ‘Communication between filamentous pathogens and plants at the biotrophic interface’ by Venutir and Fuqua, and Yi and Velent respectively, are appropriate in deciphering inter-kingdom signalling for the interaction of bacteria and fungi, the two major group of plant pathogens with that of plants. Studies on such interactions would greatly enable designing novel strategies to create disease-resistant plants. Similarly, the article by Xin and He on *Pseudomonas syringae* pathogenesis though specific in nature, provides concepts that may prove useful in generalizing to other plant pathogens. On the contrary, the article on ‘Quiescent and necrotrophic lifestyle choice during postharvest disease development’ by Prusky *et al.* is unique in the sense, that it is deliberating the contrasting

lifestyles of postharvest pathogens in activating host signals during different stages of fruit development. Since the pathogen–host interplay depends not only on mutual recognition, signalling, and the expression of pathogenicity and virulence factors from the pathogen side, but also the inducible defence mechanisms in plants through signaling, this results in compatible or incompatible interactions. The article on ‘MAPK cascades in plant disease resistance signaling’ by Meng and Zhang highlights the importance of their role in plant defence by a critical appraisal on the identification of upstream sensors and downstream substrates. Likewise, the article by Dudler provides an indepth analysis on the role of ubiquitin-26S proteasome degradation system in cellular regulatory processes and its exploitation by plant pathogens for their virulence. In plant–microbe interactions, programmed cell death impacts both resistant and susceptible interactions. The article on ‘Centrality of host cell death in plant–microbe interactions’ by Dickman and Fluhr discusses these issues with respect to pathogen lifestyle and plant genotype. These seven articles are replete with advancements in host–pathogen interactions lending further interest to their exploitation in imparting host resistance.

A third area of research extensively covered in this volume through nine articles is on disease management employing different strategies. Interference with vector transmission is one of the strategies of virus disease control. In the article by Bragard *et al.*, the current understanding of virus transmission and vector control strategies has been reviewed besides projecting future directions for developing innovative methods of vector control. However, these viral vectors also present a different set of applications in tree crops. The review by



Fruit bodies of *Heterobasidion* spp.

BOOK REVIEWS

Dawson and Folimonova is specific in focusing on the perspectives of building viral vectors for perennial crops with a case study on *Citrus tristeza virus*, which could be considered as value-added traits for plant improvement. Four articles emphasize the usefulness of host resistance. Among them, the article 'Antimicrobial defenses and resistance in forest trees: challenges and prospective in a genomic era' by Kovalchuk *et al.* explores the role of host resistance in the defence response of forest trees to their pathogens. This article has its own merit in the sense that molecular pathology of forest trees is less studied in comparison to the pathology of agricultural crops. The genetics, function and evolution of disease resistance genes in plants having been well understood by the article on 'Impacts of resistance gene genetics, function and evolution on a durable future' by Michelmore, the article by Schornack has given further insights on new strategies of disease control by a review on the modulation of TAL effectors of pathogens by plant resistance mechanisms. Likewise, the article by Kumar and Mysore provides an overview of non-host resistance and its exploitation for durable resistance in plants. Though specific to bacterial pathogens, the concepts are becoming central to other pathogens as well. The behaviours of plant diseases have been examined by Boudreau by analyses of their effects on disease dynamics. Intercropping being one of the agro practices for disease control, an improved application in disease control can be enabled by such studies. The reviews on *Trichoderma* and prophages analyse them from a genomic perspective, giving further impetus on their exploitation in advancing management strategies to contain plant pathogens. With the completion of several genome sequences of the pathogenic and non-pathogenic microbes, the contribution of genomics in understanding the bioagents is of interest. The article by Varani *et al.* establishes the role of prophages in bacterial diseases by an integration of available information. The author has also highlighted a unique interface for assessing the biology of prophages and their association with genome evolution and pathogenicity. The article by Mukherjee *et al.* focuses on the biology of the widely explored biocontrol agent, *Trichoderma* sp. and its interactions in the context of contemporary

genome research. The nine articles in general advocate the understanding of molecular complexities of host resistance or bioagents so that they can be successfully exploited for the management of plant diseases.

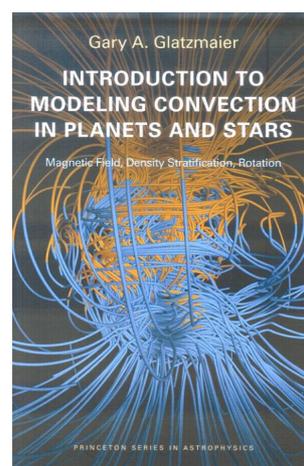
Understanding the etiology, survival, ecology and evolution of plant pathogens can have practical implications, especially in developing strategies for controlling these pathogens. Also, the unique biological systems combined with specific spatial and temporal dynamics account for the epidemics of each type of pathogen. From the article by Garbelotto and Gonthier, the possible causes for the epidemics of *Heterobasidion* sp. could be identified besides understanding their biology and mode of control. In view of the advances in molecular and genomic studies, the articles by Futai, and Castagnone-Sereno *et al.* hold good in understanding the biology of the pine wood nematode *Bursaphelenchus xylophilus* and of the root-knot nematode, *Meloidogyne* respectively. Likewise, the articles on the two major groups of plant viruses, i.e. 'Advances in understanding Begomovirus satellites' by Zhou and 'Continuous and emerging challenges of Potato virus Y in potato' by Karasev and Gray advance our knowledge on their diversity and evolution. Zhou has also highlighted the usefulness of begomoviral satellites as ideal candidates for conversion to VIGS vectors. The articles by Purchell, and Morris *et al.* with their reviews on *Xylella fastidiosa* and *Pseudomonas syringae* respectively, exemplify that paradigms can change our understanding of plant pathogens. The rational use of resistance genes and pesticides greatly depends on the knowledge of the principles and consequences of competition among pathogen strains. The review on 'Experimental measures of pathogen competition and relative fitness' by Zhan and McDonald justifies this by an exhaustive analysis of pathogen competitiveness. Clearly, the eight articles give a comprehensive understanding of the fundamentals about plant pathogens.

The compilation of the advances in concepts of varying aspects of modern plant pathology with an indepth analysis focused on the future, make this volume, a valuable resource for all those interested in crop protection. It is useful to students, researchers and policy-makers. The volume has tried to cover a wide

spectrum of topics in plant pathology and has succeeded in its endeavour.

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Introduction to Modeling Convection in Planets and Stars: Magnetic Field, Density Stratification, Rotation. Gary A. Glatzmaier. Princeton University Press, 41 William Street, Princeton, New Jersey 08540, USA. 2014. 344 pp. Price US\$ 65.00 (paper), US\$ 99.50 (cloth)/ £ 44.95.

Origin of magnetic field in the planetary cores and stellar atmosphere through a dynamo process has been an interesting and challenging area of research ever since the idea was first proposed by Larmor in 1919. The past two decades have seen significant progress in this field mainly due to the developments in high performance computing and availability of fast computing power which have enabled researchers to numerically solve full 3D global magnetohydrodynamic (MHD) equations. The book under review by Gary Glatzmaier, a renowned researcher in geophysical and astrophysical fluid dynamics, who produced the first dynamically consistent computer simulations of geodynamo and geomagnetic reversal in 1995, is a well-deserved contribution to this field. The book is aimed at undergraduate and graduate